REMARKS / ARGUMENTS

The Applicant notes that the Examiner has considered that this application is eligible for continued examination under 37 CFR 1.114 and has withdrawn the finality of the previous Office Action pursuant to 37 CFR 1.114.

This letter is responsive to the Office Action dated October 2, 2003. Accordingly, this response is accompanied by a request for a one-month extension of time. The Applicant therefore submits that this response is timely filed.

By this response, the Applicant has amended claim 28 to recite that the main noise reduction unit and the auxiliary noise reduction unit employ the same noise reduction algorithm. Support for these claim amendments is on page 5, lines 17 to 21 of the application as filed. Accordingly, the Applicant submits that no new matter has been added by this claim amendment.

In the Office Action, the Examiner made a novelty rejection to claims 21 and 27-29 under 35 U.S.C. 102(b) as being anticipated by Lindemann et al. (U.S. 5,479,522 (hereafter referred to as "Lindemann"). In particular, the Examiner argued that Lindemann teaches a noise reduction apparatus that includes an input for receiving an input signal, a compression circuit (266) for receiving a compression control signal and generating an amplification control signal (for multiplier 268), an amplification unit (multiplier 268) for receiving the input signal and the amplification control signal and generating an output signal (LEFT OUT) with compression and reduced noise, and an auxiliary noise reduction unit (260, 262, 264) connected to the input for generating an auxiliary noise reduced signal (to compression circuit 266) where the compression control signal is the auxiliary noise reduced signal (see Fig. 11 and col. 12, lines 12-61 of Lindemann).

The Applicant respectfully submits that the Lindemann reference does not disclose the Applicant's invention as claimed in claim 21 since there are a number of differences between the Lindemann device and the Applicant's invention as claimed in claim 21. Firstly, Lindemann teaches the use of two input signals (LEFT IN and RIGHT IN) whereas the Applicant claims a single input signal. Secondly, Lindemann teaches that the combination of the LEFT and RIGHT inputs (see summing block 258) is provided to the MAG SQUARED BLOCK (260), the N BAND SUM block (262) and the smoothing filter (264) block whereas the Applicant claims that a single input signal is provided to an auxiliary noise reduction unit. In addition, the LEFT input signal is not directly provided to the multiplier block (265) in the Lindemann reference. Rather Lindemann teaches using a frequency response adjustment vector (LEFT GAIN) to modify the input signal whereas the Applicant claims that the input signal is provided to the amplification unit.

In addition, the Applicant submits that Lindemann is directed towards a binaural hearing aid system in which the sound intensities of the left and right channels are used to shape the gain that is applied to these channels (hence the need for the MAG SQUARED BLOCK (260)). In contrast, the Applicant claims that the noise reduced signal is derived from a single input signal.

In addition, the Applicant submits that Lindemann does not teach a noise reduction technique that produces a noise reduced signal as claimed by the Applicant in claim 21. Rather, Lindemann teaches producing a magnitude squared signal of the summation of the left and right input signals (see block 260 in Fig. 11 of Lindemann) from the left and right channels, dividing the magnitude squared signal into a plurality of bins to obtain power estimates for each bin (see block 262 in Fig. 11 of Lindemann) and smoothing the power estimates over time to produce an input for the compression gain block (see block 266 in Fig. 11 of Lindemann). Accordingly, Lindemann does not teach applying a noise reduction technique to reduce noise in block 264 but rather teaches a technique to get a better power estimate in each of the N bands of the combination of the LEFT and RIGHT input signals. It is clearly evident that the power estimate will contain both signal and noise components.

In addition, Lindemann teaches the extra step of modifying the left and right input signals prior to multiplication (i.e. blocks 268 and 270) with the output of the compression gain block (i.e. block 266) with frequency response adjustment vectors that are a function of the audiogram measurements of the hearing loss of the hearing aid user. The Applicant does not claim this step in claim 21 and does not require this step.

Accordingly, the Applicant respectfully submits that claim 21 is novel and unobvious over the cited reference and is therefore allowable. Furthermore, since claims 22 to 24 and 27 to 30 depend from independent claim 21, and introduce other patentable features, the Applicant respectfully submits that claims 22 to 24 and 27 to 30 are also allowable.

In the Office Action, regarding claim 27, the Examiner argued that Lindemann teaches a main noise reduction unit (265, left gain vector), for generating a noise reduced signal and supplying the noise reduced signal to the amplification unit (268) in place of the input signal.

In response, the Applicant submits that Lindemann does not teach a main noise reduction unit. Rather Lindemann simply teaches amplifying certain frequency bands according to the LEFT GAIN vector which is a frequency response adjustment vector that is specific to the hearing aid user and is a function of the hearing loss of the user. The Applicant submits that when a gain is applied to some of the frequency bands, the signal and noise in those frequency bands (i.e. frequency bands of interest) get equally amplified (i.e. the same amount of gain is applied to the frequency band regardless of whether or not there is noise in the frequency band). Accordingly, the Applicant submits that the SNR in the frequency bands of interest is not improved. Consequently, the LEFT GAIN vector can not be perceived to be a noise reduction unit as claimed by the Applicant in claim 27. Accordingly, the Applicant submits that claim 27 is novel and unobvious over the cited reference and is therefore allowable.

In the Office Action, regarding claim 28, the Examiner argued that Lindemann teaches that the main noise reduction unit (265) and the auxiliary noise reduction unit (260, 262, 264) comprise a single unit.

In response, the Applicant has amended claim 28 to recite that the main noise reduction unit and the auxiliary noise reduction unit employ the same noise reduction algorithm. In the application as filed, the Applicant specifically states that the auxiliary noise reduction algorithm performed by the auxiliary noise reduction unit may be identical to the noise reduction algorithm performed by the main noise reduction unit (see pg 5, lines 17-21).

The Applicant notes that the Examiner has identified different structures in the Lindemann reference for performing noise reduction. The Applicant does not concede that these structures perform noise reduction, but if this line of reasoning provided by the Examiner is followed, then it follows that Lindemann does not teach main and auxiliary noise reduction units that use the same noise reduction algorithm. Accordingly, the Applicant submits that claim 28 is novel and unobvious over the cited reference and is therefore allowable.

In the Office Action, regarding claim 22, the Examiner argued that Lindemann teaches that the main noise reduction unit comprises a detector (microphone 16) connected to an input and providing a detection level indicative of the presence of speech, a spectral estimate means (beam spectrum subtract gain 158) for generating a noise magnitude spectral estimate, and a noise filter calculation unit (160, 162) connected to the spectral estimate means and the magnitude means for receiving the noise magnitude estimate and calculating an attenuation function.

In response, the Applicant respectfully submits that the Examiner has misread the Lindemann reference. Firstly, the microphone (16) taught by Lindemann is not a detector of speech as claimed by the Applicant in claim 22. The microphone (16) provides a sound level irrespective of whether speech or signal is provided to the

microphone (16). Accordingly, the microphone (16) does not provide a detection signal indicative of the presence of speech as claimed by the Applicant in claim 22.

Secondly, the beam spectrum subtract gain block (158) taught by Lindemann is not a spectral estimate means for generating a noise magnitude spectral estimate as claimed by the Applicant in claim 22. The beam spectrum subtract gain block (158) provides a direction estimate "d" related to the values in the frequency bands of the LEFT and RIGHT inputs of the Lindemann hearing aid.

Thirdly, the noise filter calculation unit (160, 162) taught by Lindemann is not connected to the spectral estimate means and the magnitude means for receiving the noise magnitude estimate and calculating an attenuation function as claimed by the Applicant in claim 22. Rather, the filters (160, 162) are part of the beam spectrum subtract gain block (158) and receive the inner product average and the magnitude square sum of the LEFT and RIGHT input signals. Furthermore, the filters (160, 162) do not calculate an attenuation function but rather provide simple lowpass filtering.

In light of these noted differences, the Applicant respectfully submits that claim 22 is novel and unobvious over the cited reference. Accordingly, the Applicant submits that claim 22 is allowable.

Conclusion

In view of the foregoing comments, it is respectfully submitted that the application is now in condition for allowance. If the Examiner has any further concerns regarding the language of the claims or the applicability of the prior art, the Examiner is respectfully requested to contact the undersigned at 416-957-1630.

Respectfully submitted,

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